2 Summary of Key RI Findings

This section provides a brief summary of the key findings of the Remedial Investigation (Volume 1 of this RI/FS), including the Conceptual Site Model (CSM) developed for the Whatcom Waterway site. The CSM provides a concise summary of the findings of the remedial investigation and is presented in Section 8 of the RI Report.

All information contained in this section is described in greater detail in Volume 1 of this RI/FS report. The reader should refer to that document for the detailed information on which the CSM is based.

2.1 Contaminants and Sources

As measured by relative concentration and frequency of detection, the principal contaminants in the site sediments are mercury, 4-methylphenol and phenol. Table 2-1 summarizes the principal contaminants and sources for the Whatcom Waterway site. The table includes a summary of the status of source control activities.

- **Mercury Contamination is Predominantly from Historical Sources:** The primary source of mercury within the Whatcom Waterway site sediments was the discharge of mercury-containing wastewaters from the chlor-alkali plant between 1965 and the 1970s. This historic source of mercury contamination has been controlled. Following initial pollution control upgrades by GP in the early 1970s, direct discharge of chlor-alkali plant wastewaters to the Whatcom Waterway was terminated. Then in 1999 the chlor-alkali plant was closed by GP, eliminating the generation of mercury-containing wastewater. The restoration of the Log Pond area in 2000 and 2001 controlled the secondary source of mercury, by capping impacted sediments in this area. Some regional and natural sources of mercury continue to exist, but these natural and regional sources are not expected to result in exceedances of Site screening levels.

- **Phenolic Compounds are Predominantly from Historical Sources:** The primary sources of phenolic compounds within the Whatcom Waterway Site sediments include historical wood products handling and log rafting, historical pulp mill discharges prior to implementation of primary and secondary wastewater treatment, and potential lesser contributions from historical stormwater and wastewater discharges. These sources have been controlled. Wood products handling activities are less common than there were historically, and additional regulatory and permitting requirements minimize the potential for discharges of wood wastes to sediments. Pulp mill wastewater discharges were better controlled after the

1960s and 1970s, and discharge of process wastewaters to the Whatcom Waterway was terminated in 1979. The pulp mill was closed by GP in 2000, terminating the discharge of pulp and chemical plant wastewaters to the aerated stabilization basin (ASB).

Because primary contamination sources have been controlled, the main focus of the remaining site cleanup actions will be to address secondary contamination sources, the residual contamination in sediments at the site.

A number of other contaminated sites are located in the vicinity of the Whatcom Waterway site and are being address by Ecology. These sites do not represent a current source control concern for Whatcom Waterway site sediments or surface water quality.

2.2 Nature and Extent of Contamination

The nature and extent of contamination impacts within the Whatcom Waterway site have been conclusively determined through over a decade of intensive investigations as part of the RI/FS and Bellingham Bay Pilot activities. These investigations in turn build on previous studies performed by academic researchers, regulatory agencies and local industry and government. The result is a wealth of knowledge about site conditions, and the factors that influence the selection of a final site cleanup.

The findings of the site investigations are the focus of the RI report. Table 2-2 provides a quick summary of the principal RI activities and their findings. These findings are graphically displayed in the Conceptual Site Model in Figures 2-1 and 2-2. Site screening levels discussed in this section are defined in Section 4 of the RI Report.

- **Waterway Sediments:** The Whatcom Waterway sediments generally consist of a layer of soft, silty, impacted sediments. The elevation and thickness of the impacted layer varies with location, but is generally between 2 and 10 feet in thickness. The sediments are thickest in historically dredged and filled areas along the Inner Waterway. The impacted Waterway sediments are subject to natural recovery by ongoing deposition of clean sediments. Except in some high-energy, nearshore areas offshore of the ASB, the impacted sediments are covered by a layer of clean sediments. These clean sediments have been naturally deposited, and the surface sediments of the bioactive zone comply with sediment screening levels protective of environmental receptors. This process of natural recovery is expected to continue into the foreseeable future. Mercury concentrations within the site subsurface sediments are typically in the low part-per-million range, and average subsurface mercury concentrations decrease with distance from the Log Pond source area. Phenolic compounds

are also present in the Waterway in the low part-per-million range. The highest phenolic concentrations were detected in subsurface sediments within the Inner Waterway, near the historic pulp mill effluent discharge locations from the 1950s and 1960s. The impacted sediments are underlain by clean, native sandy sediments of varying thicknesses.

- **Log Pond Sediments:** The Log Pond area was the site of the historic mercury-containing wastewater discharge from the chlor-alkali plant during the 1960s and 1970s. Subsurface sediments in this area contain the highest mercury levels present at the site. Ecology determined that removal of these sediments was not technically practicable. This area was remediated by capping as part of an Interim Action that was implemented in 2000 and 2001. Sediment monitoring since that time has demonstrated that the cap is performing well, and is successfully preventing underlying contaminants from migrating upward through the cap. Monitoring of groundwater discharges in the cap area has demonstrated no ongoing impacts to surface water quality or cap conditions from the adjacent chlor-alkali plant upland areas. Biological monitoring has demonstrated that the capped area has recovered biological functions for benthic and epibenthic organisms, for juvenile salmonids and shellfish. Tissue monitoring has demonstrated that bioaccumulation risks have been successfully controlled, and crab tissue sampled from the area is not significantly different from crab tissue collected from clean reference sites. Some wave-induced erosion has been noted at the shoreline edges of the cap, and enhancements to these areas will be required to prevent cap recontamination and to maintain the long-term protectiveness of the remedy. The Feasibility Study includes proposed cap enhancements as part of the final remedial alternatives for the Whatcom Waterway site.

- **ASB Areas:** Figure 2-2 provides a graphical summary of the conditions in the ASB area. The ASB was originally constructed as a stone, sand and clay berm, enclosing a basin dredged in 1978. Some impacted sediments exist underneath portions of the berm. However, the berm consists primarily of clean materials imported at the time of construction. Testing and engineering evaluations have shown that the berm materials are of sufficient quality for reuse. A thick layer of wastewater treatment sludges has accumulated within the ASB. These sludges are soft, flocculant, high-organic materials containing elevated levels of mercury, phenolic compounds and other contaminants. However, the sludges have not significantly impacted the clean native sands underlying the basin. The evaluation of potential remedial alternatives for the ASB area will take into account the special

physical and chemical properties of the ASB materials, and the potential future uses of the ASB area.

- **Starr Rock Area:** Site investigations have documented the nature and extent of contamination present at the former Starr Rock dredge disposal site. This area is located in a deep-water, low energy portion of the Whatcom Waterway site. Natural recovery has occurred in this area, with impacted mercury and phenol-impacted sediments being covered by clean sediments. There are no current exceedances of site screening levels in this area.

2.3 Fate and Transport Processes

Sediments within the Whatcom Waterway site are acted upon by natural and anthropogenic forces that affect the fate and transport of sediment contaminants. Significant fate and transport processes evaluated as part of the RI include the following:

- **Sediment Natural Recovery:** Processes of natural recovery have been extensively documented within the Whatcom Waterway site. Sediments in most areas of the site are stable and depositional, and clean sediments continually deposit on top of the sediment surface. RI investigations have documented depositional rates and have verified that patterns of deposition and natural recovery are consistent throughout most site areas. The exception to this general observation is in nearshore, high-energy areas where recovery rates are reduced by the resuspension of fine-grained sediments. In all other areas of the site, cleaner sediments are consistently observed on top of impacted sediments. As part of the 2000 RI/FS, site data and recovery models were used to produce quantitative estimates estimate natural recovery rates. These estimates were then empirically verified by resampling surface sediments and comparing observed recovery rates with model predictions.

- **Erosional Processes:** The effects of wind/wave erosional forces represent the principal natural process affecting sediment stability. RI investigations and FS engineering evaluations have identified high-energy, nearshore areas where the natural deposition of fine-grained sediments does not occur, or occurs at slower rates. In these areas, fine-grained sediments can be resuspended, mixed and/or transported by wave energy. The erosional forces vary with location, water depth, sediment particle size and shoreline geometry. These forces are minimal in deep-water areas which represent the majority of the Whatcom Waterway site. The FS incorporates analyses of erosional forces in consideration of site remediation areas and applicable technologies.

- **Navigation Dredging and Shoreline Infrastructure:** Navigation dredging and the construction of associated shoreline infrastructure have been prominent features of the Whatcom Waterway site, and have shaped the current site lithology. The RI/FS includes extensive discussion of historic and future navigation and infrastructure issues that could affect the fate of site sediments. The FS incorporates potential future dredging activities as part of the evaluation of the long-term effectiveness of the remedial alternatives. The companion EIS document assesses the inter-relationships between site cleanup decisions and community land use and habitat enhancement objectives, consistent with the requirements of SEPA regulations and the goals of the Pilot.

- **Other Processes:** As part of the evaluation of sediment stability, the RI included a discussion of bioturbation, prop wash and anchor drag. These processes can result in periodic disturbances of the sediment column, and can enhance mixing of surface sediments with underlying sediments. These processes are all ongoing and are incorporated in the empirically measured rates and performance of natural recovery. However, they are relevant in the evaluation of the long-term stability of subsurface sediments. Prop-wash in particular will affect sediment stability in near-shore navigation areas. These factors are incorporated into the FS analysis of remedial alternatives.

2.4 Exposure Pathways and Receptors

Section 4 of the RI report discusses the principal environmental receptors and exposure pathways applicable to the Whatcom Waterway site. That section also discusses the site screening levels that are used to evaluate protection of these receptors. Exposure pathways and receptors are illustrated in Figures 2-1 and 2-2, and are summarized in Table 2-4.

- **Protection of Benthic Organisms:** The primary environmental receptors applicable to the Whatcom Waterway site consist of sediment-dwelling organisms. These benthic and epibenthic invertebrates are located near the base of the food chain and are important indicators of overall environmental health. Both chemical and biological monitoring are used to test for potential toxic effects. Chemical and biological standards specified under SMS are used to screen for such effects. The use of SMS whole-sediment bioassays provides an ability to test for potential synergistic effects between multiple chemicals, and to test for potential impacts associated with parameters that may not have been measured as part of chemical testing.

- **Protection of Human Health:** Mercury is one of the primary contaminants present at the Whatcom Waterway site. Mercury can be converted to methylmercury, which in turn can bioaccumulate through the food chain. As part of the 2000 RI/FS a bioaccumulation screening level (BSL) was developed that would be protective of both recreational and tribal fishing and seafood consumption practices as described in Section 4 of the RI Report. The BSL was developed using conservative exposure assumptions, to ensure that the value would be protective. An additional degree of protectiveness has been obtained in the way that the BSL is applied to the site decision-making. Specifically, the BSL has been applied as a "ceiling" value for all surface sediments at the site, including individual data points or clusters. This application provides a substantial additional degree of protectiveness, because it is the area-weighted average sediment mercury concentration that drives biological risks. Area-weighted average concentrations within the Whatcom Waterway site are currently between two and three times lower than the BSL itself. The FS considers remediation of all areas exceeding the BSL on a point-by-point basis, even though the area-weighted average is already below the BSL. This application of the BSL further reduces the potential risks associated with the site. The result is to maintain a robust level of protectiveness, in excess of that required to protect human health under reasonable assumptions.

- **Protection of Ecological Health:** As with human health, ecological receptors can be impacted by mercury bioaccumulation. However, the application of the BSL to cleanup at the site ensures protectiveness to ecological receptors. The protectiveness of the BSL to ecological receptors was evaluated in several ways as part of the RI process. First, the protectiveness of the BSL was evaluated against potential marine mammal exposures. The Second, bioaccumulation testing has been performed on sediments from the Whatcom Waterway site at concentrations exceeding the BSL, demonstrating no significant bioaccumulation at these sediment concentrations. Third, tissue monitoring has been performed a the site as part of the Log Pond Interim Action. That monitoring has shown that compliance with the BSL prevents the accumulation of mercury in crab tissue in comparison to clean reference areas. Based on these three lines of evidence, the compliance with the mercury BSL and with SMS criteria for benthic organisms results in protection of ecological receptors.

- **Other Considerations:** The FS includes evaluations of remedial technologies that may trigger new exposure pathway and receptor risks. For example, dredging of impacted sediments triggers short-term risks at the point of dredging and in material handling areas,

and during transport of these materials to the disposal site. Additional exposure pathways and receptors are potentially affected at the location of dredge material disposal. The RI included engineering testing that was focused on providing empirical data necessary to evaluate these additional exposure pathways and receptor risks. These data are then used as part of the FS, in conjunction with applicable regulatory guidelines and requirements, to evaluate the feasibility, protectiveness and costs of different remedial strategies.

Table 2-1. Summary of Principal Contaminants and Sources

Principal Site Contaminants	Principal Source(s)	Source Control Status
Mercury	**Wastewater Discharges to Log Pond**	**Controlled**
		- Discharges terminated in the 1970s
	Groundwater Discharges to Log Pond	**Controlled**
		- Monitoring indicates no continuing discharges affecting Log Pond sediments or water quality
		- Additional actions to be evaluated as part of the chlor-alkali site RI/FS and site cleanup
	Log Pond Sediments	**Partially Controlled**
		- Area capped as part of successful interim action
		- Cap enhancements to be included in final site cleanup to ensure long-term stability of cap edges
	Historic Dredge Disposal	**Controlled**
		- Rigorous dredge material characterization and management protocols now required by regulation and permit for all dredging projects
	Chlor-Alkali Plant Discharges to ASB	**Controlled**
		- Chlor-alkali plant was closed and demolished by GP, with termination of wastewater discharges to the ASB.
Phenolic Compounds	**Historic Pulp Mill Discharges to Waterway**	**Controlled**
		- NPDES Wastewater improvements implemented in the 1970s, including primary & secondary treatment, and termination of waterway discharges.
		- Early remedial efforts completed in the Whatcom Waterway included sediment removal actions in 1974
	Pulp Mill Discharges to ASB	**Controlled**
		- Pulp mill and associated chemical plant were closed by by GP, with termination of associated wastewater discharges to the ASB.
	Wood Waste from Log Rafting	**Controlled** - Cargo shipments of logs and wood products have been reduced, and additional regulatory and permit-required pollution controls apply to log/wood handling activities.
	Historic Sewer Outfalls	**Controlled**
		- Sewage treatment and discharge improvements implemented in the 1960s and 1970s.
	Stormwater Discharges	**Controlled**
		- Ongoing stormwater system upgrades to reduce/eliminate CSO events.
		- No evidence of ongoing sediment impact in intermittent CSO area
		- Enhanced stormwater management practices, permitting and monitoring.
Other Compounds	**Boatyard Wastes** (Copper, Zinc, TBT)	**Controlled**
		- Closure of early over-water boat lift formerly located adjacent to Colony Wharf site.
		- Enhanced stormwater controls and permitting at Colony Wharf site.
	Creosoted Pilings (PAH Compounds)	**Controlled**
		- Changes in materials use for new construction
		- Ongoing pile removal programs being implemented by Port, DNR and Ecology.
	Cargo Spillage (PAH Compounds, Wood Waste)	**Controlled**
		- Reductions in Log/Wood/Chip handling
		- Changes in cargo handling practices
		- Proactive materials management planning for new cargos
	Phthalate & Nickel Sources (I&J Waterway Site Area)	**Controlled**
		- Elimination of historic sources of these compounds (i.e., Olivine ore, historic plant fire)
		- Investigation & Cleanup of the I&J Waterway site under an Agreed Order and Ecology oversight
Contaminants at Adjacent Sites		**Ongoing Investigation & Cleanup**
		- Actions at other waterfront sites coordinated under the Bellingham Bay Demonstration Pilot

Notes:

This table summarizes primary sources of sediment contamination. Secondary sources of sediment contamination (i.e., volumes of impacted sediment present at the site) are to be addressed as part of the final remedial action evaluated in the RI/FS.

Section 2 of the RI contains an overall history of the Whatcom Waterway site.

Section 6.1 of the RI includes a detailed discussion of site source control activities.

Table 2-2. Nature & Extent of Impacts

Site Study Area	Study Topics	Principal RI Activities & Findings	Quick Reference to Relevant RI Report Sections
Waterway Sediments	Assess current site lithology, including the impacts of historic dredging and shoreline development activities	Site lithology characterized through review of historic records, review of historic sediment borigns, and completion of extensive subsurface physical and chemical testing	Section 3.1 includes a discussion of site lithology, with accompanying geologic cross-sections developed from subsurface explorations.
	Document the nature & extent of current impacts in the bioactive zone (surface sediments)	Surface sediment testing performed using chemical testing and whole-sediment bioassays	Section 5.2 figures, tables and text summarize the results of chemical and bioassay testing.
	Documentation the extent of natural recovery processes occurring at the site	Natural recovery processes studied with cores and sediment traps, modeled quantitatively and then verified through direct observation of decreasing sediment concentrations	Section 6.2 documents natural recovery processes evaluated at the site. Changes in surface sediment conditiosn over time are documented in Section 5.2.
	Quantify the nature & extent of subsurface sediment impacts	Core sampling used to directly assess the nature and extent of subsurface sediment impacts	Subsurface sediment quality summarized in Section 5.3. Refer also to the cross-sections and the lithology discussion in Section 3.1.
	Assess potential dredge disposal properties of waterway sediments	Dredge disposal suitability testing performed in support of the Feasibility Study	Previous dredge material evaluations summarized in Section 7, and in Appendix H.
Log Pond Sediments	Delineate surface & subsurface impacted sediments	RI activities included surface and subsurface testing prior to implementation of Log Pond Interim Action	Surface and subsurface sediment quality data are summarized in Section 5.2 and 5.3.
	Monitor effectiveness of Interim Action and assess any potentially appropraite cap enhancements	Effectiveness of Interim Action has been assesed through implementation of Year-1, Year-2 and Year-5 monitoring events	The Year-5 Log Pond Monitoring report is attached as Appendix I. Proposed enhancements to the Log Pond cap are discussed in the site Feasibility Study.
	Assess the potential performance of in situ treatment technologies for application at the site	In situ treatment pilot test performed in support of the Feasibility Study	Results of ECRT pilot testing are summarized in Section 7.
ASB Areas	Assess current site lithology, including the impacts of historic dredging and shoreline development activities	Site lithology characterized through review of historic records, review of historic sediment borings, and completion of extensive subsurface physical and chemical testing	Section 3.1 includes a discussion of site lithology, with accompanying geologic cross-sections developed from subsurface explorations.
	Assess the volume and thickness of the ASB sludges	Bathymetric and invasive physical testing used to quantify the volume of the ASB sludges	Bathymetric data are summarized in Section 3.1 and accompanying figures. Physical testing data are summarized in Appendix C and Appendix D to the RI.
	Assess the chemical Properties of ASB Sludges	Core sampling used to document concentrations of mercury, phenoloic compounds and other contaminants in ASB sludges.	Chemical properties of the ASB sludges are summarzied in Section 5.3 and the accompanying figures and tables, and in Appendix C.
	Evaluate the characteristics of the ASB berm materials	Berm sand quality assessed through direct chemical and physical testing, to assess potential for reuse of these materials.	Chemical properties of the berm sands are summarzied in Section 5.3 and the accompanying figures and tables, and in Appendix D.
	Quantify the characteristics of the sands underlying the ASB	Chemical and physical testing performed for the sands underlying the ASB sludges	Chemical properties of the berm sands are summarzied in Section 5.3 and the accompanying figures and tables, and in Appendix C.
	Assess the physical properties of the sludges relevant to site remedial decisions	Physical properties of the sludges assessed through physical and geotechnical testing, and during dewatering tests performed in support of the Feasibility Study.	Geotechnical properties of ASB materials are included in Appendix C. Dewatering test results are summarized in Section 7, and in Appendix D.
Starr Rock Area	Nature & extent of historic dredge disposal area	Area of dredge disposal documented through review of historic records, site bathymetric monitoring and delineation of sediment areas containing elevated mercury levels	Disposal site location identified in Figure 3-1. Sediment quality data are summarized in Section 5.2 and in associated figures and tables.
	Effectiveness of natural recovery	Site monitoring has verified compliance with sediment standards (biological SQS and site-specific BSL)	Current site data are summarized in Section 5.2 and in Figure 5-2.

Table 2-3. Fate & Transport Processes

Fate & Transport Process	Principal Issues & Observations	Summary of RI Findings
Natural Recovery	Deposition of clean surface sediments	Gross & net deposition rates quantified with sediment traps and natural recovery cores
		Reductions in contaminant concentrations documented and correlated to specific time signatures in sediment cores
		Consistent recovery pattern verified with core and grab sampling throughout site
	Measurement of natural recovery rates	Previous natural recovery studies by others
		Predictive recovery modeling as part of 2000 RI/FS
	Verification of recovery model outputs	Measured reduction of surface sediment contaminant levels between 1996/1998 and 2002 sampling events
		Observed contaminant reductions consistent with 2000 model outputs.
	Limitations of natural recovery	Areas of reduced natural recovery identified through physical and chemical mapping, and analysis of erosional properties.
Erosional Processes	Reduced natural recovery in high energy, shallow-water areas	Shallow-water, high energy areas with low natural recovery rates identified offshore of ASB
	Redistribution of fine-grained sediments in nearshore areas	Wind and wave energy analysis conducted as part of RI/FS activities to identify areas of potential significance
		Shoreline stability incoroporated into Feasibility Study and remedial design evaluations
	Shoreline infrastructure needs assessed in relation to navigation uses and shoreline/waterway geometry	Analysis of shoreline stability and potential future shoreline infrastructure needs incorporated into Feasibility Study
Navigation Dredging	Impacts to waterway and ASB bathymetry	Historic dredge contacts documented as part of site lithology
	Periodic re-exposure of subsurface sediments if remaining within proposed dredge units	Potential future navigation dredging needs incorporated into Feasibility Study and remedial design evaluations
	Historic dredge disposal areas	Extent of dredge disposal impacts quantified in Starr Rock area
	Potential disposal options for future navigation dredging	Dredge material characterizations incorporated into RI activities in support of Feasibility Study
Bioturbation	Formation of mixed bioactive zone	Bioactive zone thickness measured to be 12 cm
	Periodic deep sediment mixing	Analaysis of potential deep mixing events conducted
Propellor Wash	Potential sediment erosion in navigation areas	Propellor wash issues identified for evaluation as part of Feasibility Study and remedial design efforts
Anchor Drag	Periodic mixing of surface & subsurface sediments in anchorage areas	Limited impact due to limited use of anchors within principal site areas (i.e., availability of dock moorage, alternative anchorage sites)
		Potential for periodic deep mixing evaluated for consideration during RI/FS and remedial design

Notes:

Natural recovery and fate and transport processes are described in Section 6.2 and 6.3 of the RI report.
Land use and navigation issues are discussed in Section 3.3 of the RI report.

Table 2-4. Exposure Pathways and Receptors

Receptor	Exposure Pathway	Basis for Evaluating Protectiveness
Benthic Organisms	Direct toxicity to benthic/epibenthic invertebrates	Screening for areas of potential impact using SMS numeric standards
		Verification using whole-sediment bioassays and SMS interpretive criteria
Human Health	Contaminant exposure through consumption of seafood containing bioaccumulated mercury and/or methylmercury	Development of a site-specific BSL as part of 2000 RI/FS activities to identify sediment concentrations that will prevent significant bioaccumulation impacts
		Conservative application of BSL in site decision-making to ensure a substantial additional degree of protectiveness
Ecological Health	Exposure of higher trophic level wildlife (e.g., whales) through consumption of benthic organisms	BSL assessed to verify its protectiveness of potential wildlife exposures
		Verification of BSL protectiveness through sediment bioaccumulation tests and seafood tissue monitoring
Other Considerations	Cross-media transfers (e.g., contaminant leaching) and subsequent exposure to human health or environmental receptors	Contaminant mobility studies conducted in support of Feasibility Study and Remedial Design efforts
	Direct contact of human health and ecologyical receptors at dredge disposal locations	Applicable regulatory standards for dredge disposal scenarios evaluated as part of Feasibility Study

Notes:

Section 4 of the RI Report contains a summary of exposure pathways and receptors, and a discussion of the screening levels used to evaluate the protectiveness of site conditions under these exposure conditions.

Figure 2-1
Conceptual Site Model – Part 1 of 2
(Log Pond and Waterway Areas)

RETEC

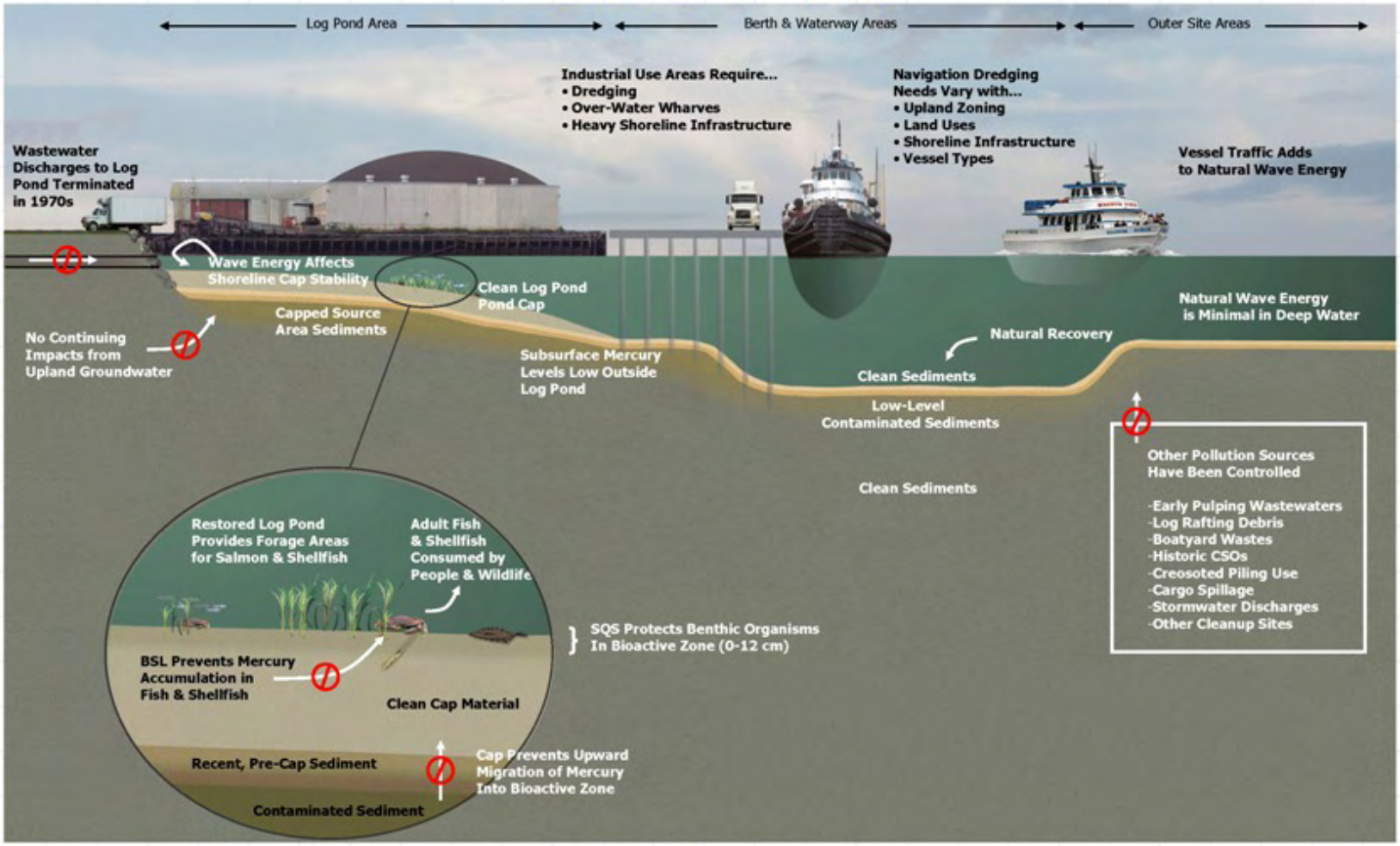
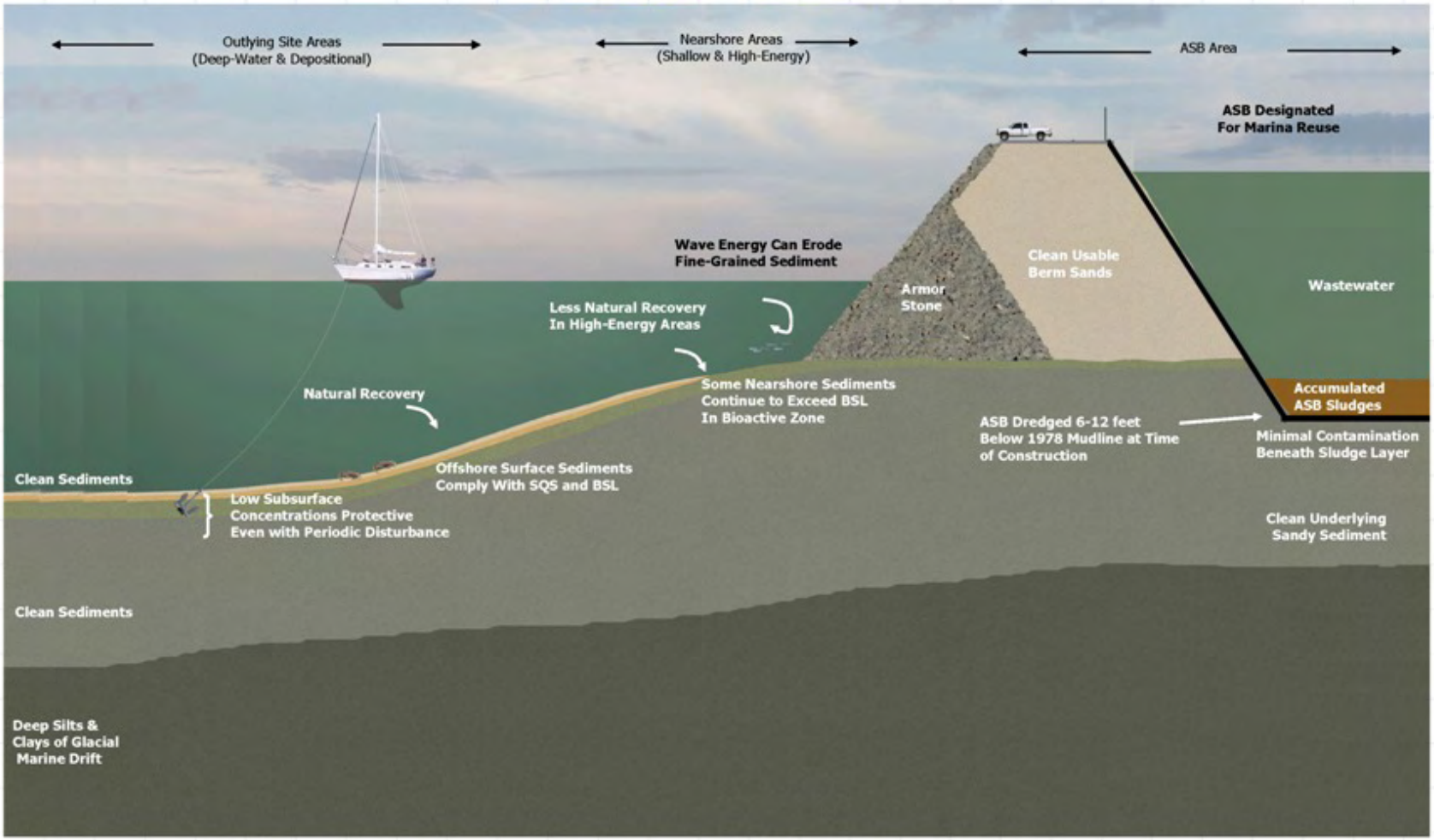
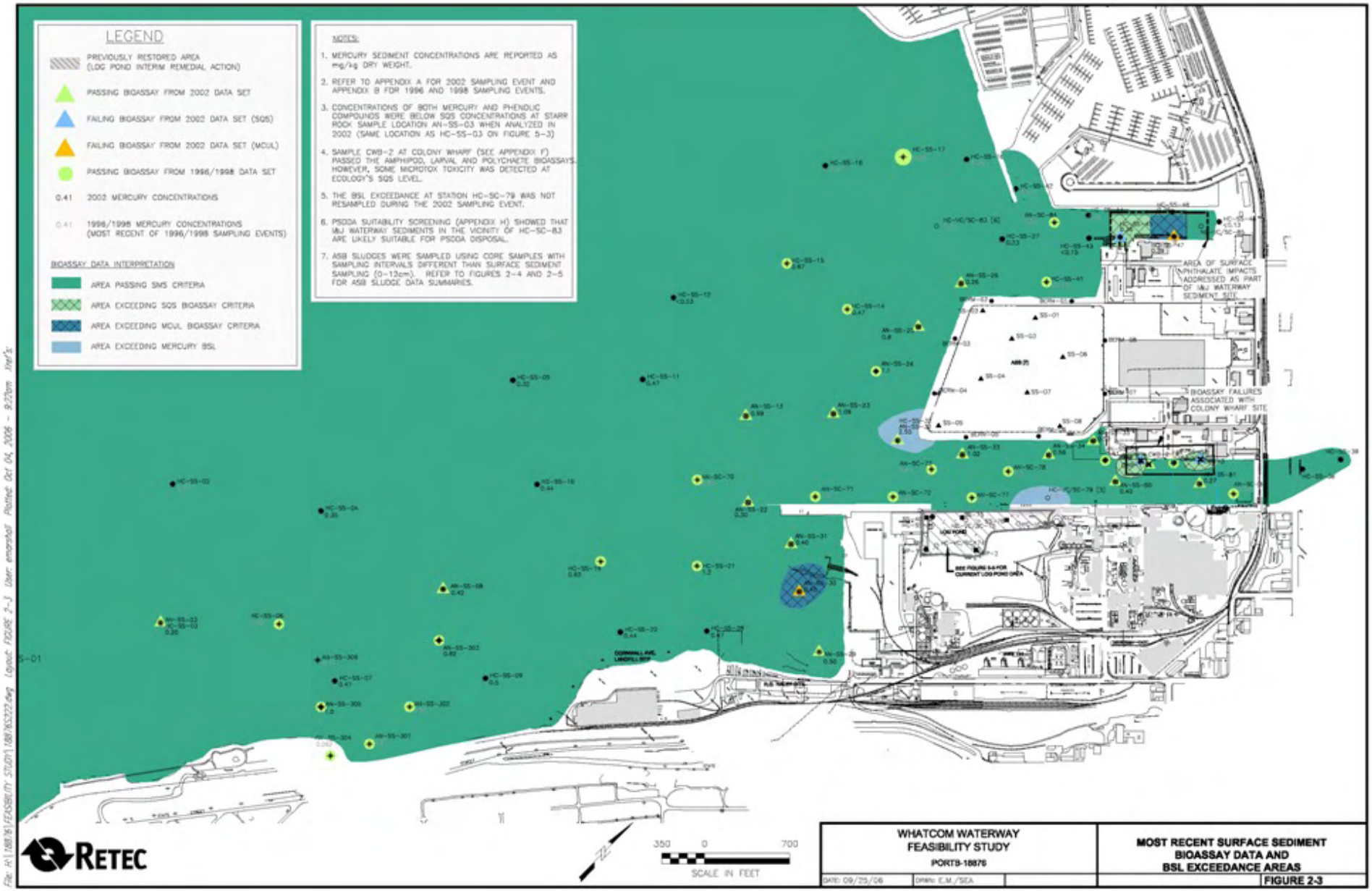
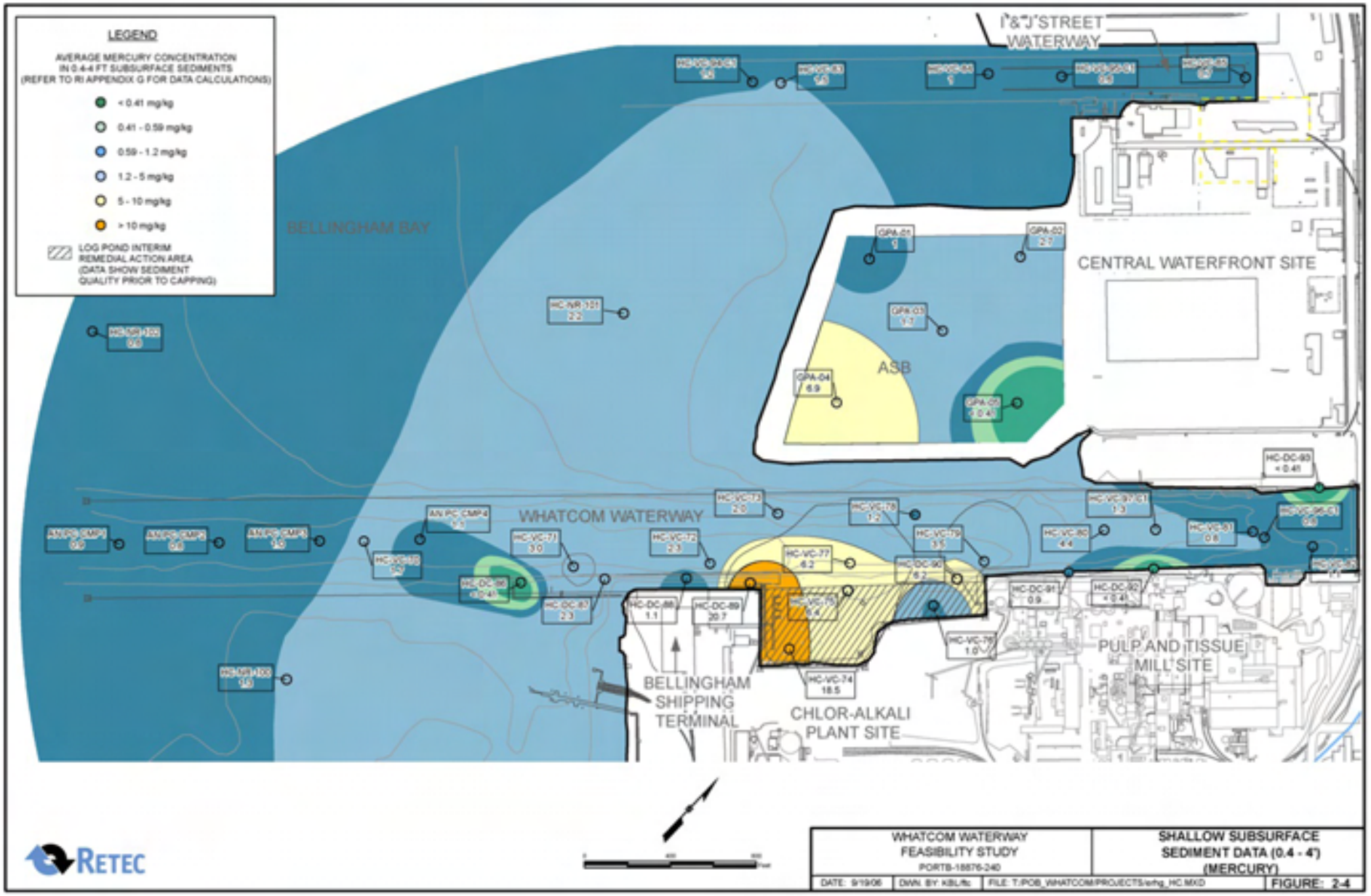


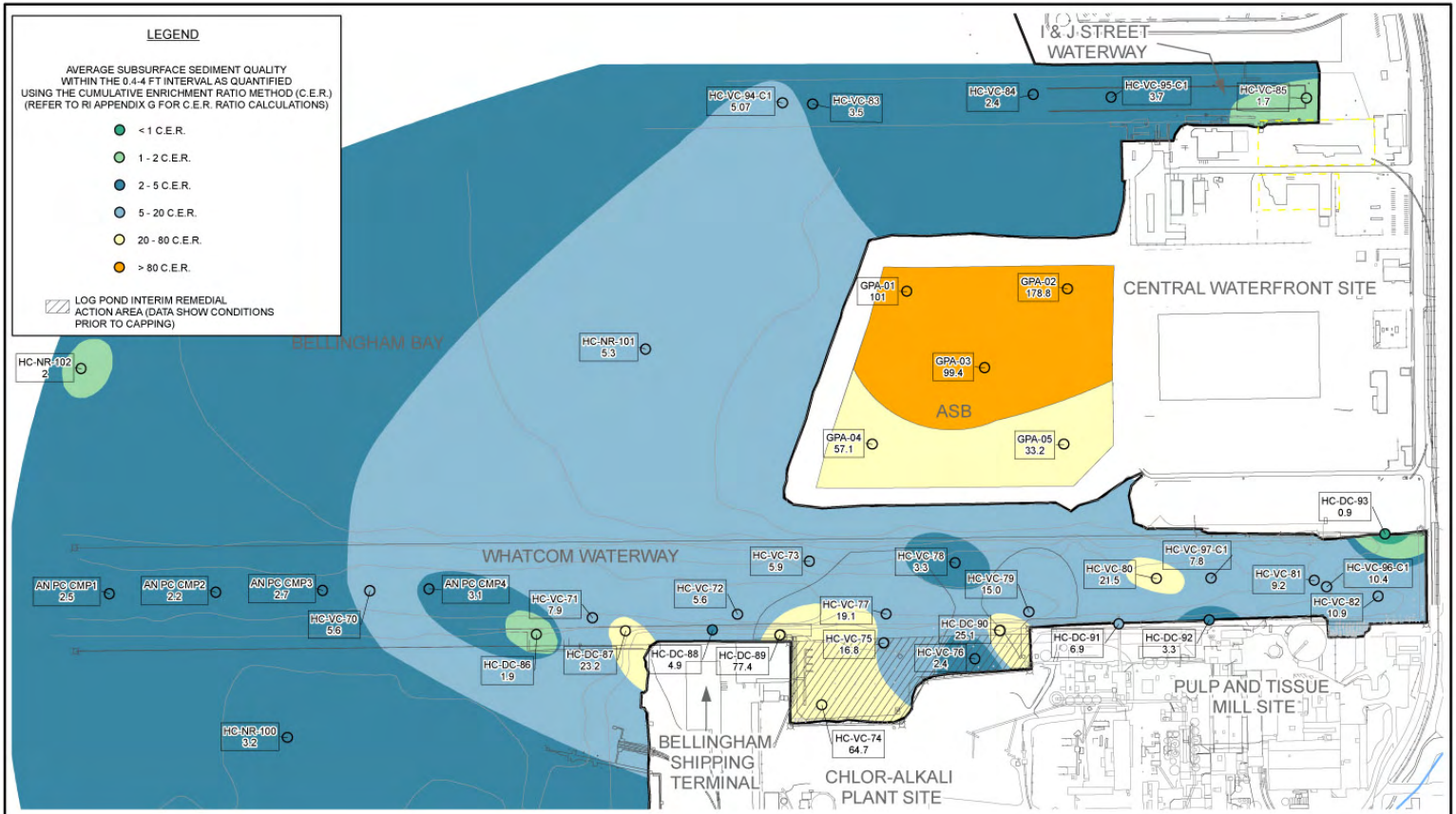
Figure 2-2
Conceptual Site Model – Part 2 of 2
(ASB and Outlying Site Areas)

RETEC




LEGEND
PREVIOUSLY RESTORED AREA (LOG POND INTERIM REMEDIAL ACTION)
PASSING BIOASSAY FROM 2002 DATA SET
FAILING BIOASSAY FROM 2002 DATA SET (SQS)
FAILING BIOASSAY FROM 2002 DATA SET (MCUL)
PASSING BIOASSAY FROM 1998/1998 DATA SET
0.41 2002 MERCURY CONCENTRATIONS
0.41 1998/1998 MERCURY CONCENTRATIONS (MOST RECENT OF 1998/1998 SAMPLING EVENTS)
BIOASSAY DATA INTERPRETATION
AREA PASSING SMS CRITERIA
AREA EXCEEDING SQS BIOASSAY CRITERIA
AREA EXCEEDING MCUL BIOASSAY CRITERIA
AREA EXCEEDING MERCURY BSL
NOTES:
1. MERCURY SEDIMENT CONCENTRATIONS ARE REPORTED AS mg/kg DRY WEIGHT.
2. REFER TO APPENDIX A FOR 2002 SAMPLING EVENT AND APPENDIX B FOR 1998 AND 1998 SAMPLING EVENTS.
3. CONCENTRATIONS OF BOTH MERCURY AND PHENOLIC COMPOUNDS WERE BELOW SQS CONCENTRATIONS AT STARR ROCK SAMPLE LOCATION AN-SS-03 WHEN ANALYZED IN 2002 (SAME LOCATION AS HC-SS-03 ON FIGURE 5-3)
4. SAMPLE CWB-2 AT COLONY WHARF (SEE APPENDIX F) PASSED THE AMPHIPOD, LARVAL AND POLYCHAETE BIOASSAYS. HOWEVER, SOME MICROTOX TOXICITY WAS DETECTED AT ECOLOGY'S SQS LEVEL.
5. THE BSL EXCEEDANCE AT STATION HC-SC-79 WAS NOT RESAMPLED DURING THE 2002 SAMPLING EVENT.
6. PSDDA SUITABILITY SCREENING (APPENDIX H) SHOWED THAT I&J WATERWAY SEDIMENTS IN THE VICINITY OF HC-SC-83 ARE LIKELY SUITABLE FOR PSDDA DISPOSAL.
7. ASB SLUDGES WERE SAMPLED USING CORE SAMPLES WITH SAMPLING INTERVALS DIFFERENT THAN SURFACE SEDIMENT SAMPLING (0-12cm). REFER TO FIGURES 2-4 AND 2-5 FOR ASB SLUDGE DATA SUMMARIES.
AREA OF SURFACE PHTHALATE IMPACTS ADDRESSED AS PART OF I&J WATERWAY SEDIMENT SITE
BIOASSAY FAILURES ASSOCIATED WITH COLONY WHARF SITE
SEE FIGURE 5-5 FOR CURRENT LOG POND AREA
CORNWALL AVE. LANDFILL SITE
SLIP 3
SLIP 4
350 0 700
SCALE IN FEET
RETEC
WHATCOM WATERWAY FEASIBILITY STUDY
PORTS-18876
DATE: 09/25/06
DRWN: E.M./SEA
MOST RECENT SURFACE SEDIMENT BIOASSAY DATA AND BSL EXCEEDANCE AREAS
FIGURE 2-3
File: K:\18876\FEASIBILITY STUDY\18876D323.dwg Layout: FIGURE 2-3 User: emayhall Plotted: Oct 04, 2006 - 9:23pm Xref's:


LEGEND
AVERAGE MERCURY CONCENTRATION IN 0.4-4 FT SUBSURFACE SEDIMENTS (REFER TO RI APPENDIX G FOR DATA CALCULATIONS)
< 0.41 mg/kg
0.41 - 0.59 mg/kg
0.59 - 1.2 mg/kg
1.2 - 5 mg/kg
5 - 10 mg/kg
> 10 mg/kg
LOG POND INTERIM REMEDIAL ACTION AREA (DATA SHOW SEDIMENT QUALITY PRIOR TO CAPPING)
I"&"J" STREET WATERWAY
BELLINGHAM BAY
CENTRAL WATERFRONT SITE
ASB
WHATCOM WATERWAY
BELLINGHAM SHIPPING TERMINAL
CHLOR-ALKALI PLANT SITE
PULP AND TISSUE MILL SITE
HC-IVR-101 2.2
GPA-01 1
GPA-02 2.7
GPA-03 1.1
GPA-04 6.9
GPA-05 < 0.41
HC-DC-93 < 0.41
HC-VC-97-C1 1.3
HC-VC-96-C1 0.6
HC-VC-93 0.8
HC-VC-92 4.4
HC-VC-79 3.5
HC-VC-78 1.2
HC-VC-73 2.0
HC-VC-72 2.3
HC-VC-71 3.0
HC-VC-77 6.2
HC-VC-75 5.4
HC-VC-74 18.5
HC-VC-76 1.0
HC-DC-90 6.2
HC-DC-91 0.9
HC-DC-92 < 0.41
HC-DC-89 20.7
HC-DC-88 1.1
HC-DC-87 2.3
HC-DC-86 < 0.41
HC-DC-85 5.7
AN-PC-CMP-4 1.1
AN-PS-CMP-1 0.9
AN-PS-CMP-2 0.8
AN-PS-CMP-3 1.0
HC-SR-102 0.8
HC-SR-103 1.0
RETEC
WHATCOM WATERWAY FEASIBILITY STUDY
PORTB-18876-240
SHALLOW SUBSURFACE SEDIMENT DATA (0.4 - 4') (MERCURY)
DATE: 9/19/06
DWN. BY: KBL/tlc
FILE: T:/POB_WHATCOM/PROJECTS/enfg_HC.MXD
FIGURE: 2-4


LEGEND
AVERAGE SUBSURFACE SEDIMENT QUALITY WITHIN THE 0.4-4 FT INTERVAL AS QUANTIFIED USING THE CUMULATIVE ENRICHMENT RATIO METHOD (C.E.R.) (REFER TO RI APPENDIX G FOR C.E.R. RATIO CALCULATIONS)
< 1 C.E.R.
1 - 2 C.E.R.
2 - 5 C.E.R.
5 - 20 C.E.R.
20 - 80 C.E.R.
> 80 C.E.R.
LOG POND INTERIM REMEDIAL ACTION AREA (DATA SHOW CONDITIONS PRIOR TO CAPPING)
I & J STREET WATERWAY
BELLINGHAM BAY
CENTRAL WATERFRONT SITE
ASB
WHATCOM WATERWAY
PULP AND TISSUE MILL SITE
BELLINGHAM SHIPPING TERMINAL
CHLOR-ALKALI PLANT SITE
HC-VC-94-C1 5.07
HC-VC-83 3.5
HC-VC-84 2.4
HC-VC-95-C1 3.7
HC-VC-85 1.7
GPA-01 101
GPA-02 178.8
GPA-03 99.4
GPA-04 57.1
GPA-05 33.2
HC-NR-101 5.3
HC-NR-102 2
HC-DC-93 0.9
HC-VC-97-C1 7.8
HC-VC-96-C1 10.4
HC-VC-81 9.2
HC-VC-82 10.9
HC-VC-80 21.5
HC-VC-79 15.0
HC-VC-78 3.3
HC-VC-73 5.9
HC-VC-72 5.6
HC-VC-71 7.9
HC-VC-70 5.6
AN PC CMP1 2.5
AN PC CMP2 2.2
AN PC CMP3 2.7
AN PC CMP4 3.1
HC-DC-86 1.9
HC-DC-87 23.2
HC-DC-88 4.9
HC-DC-89 77.4
HC-VC-77 19.1
HC-VC-75 16.8
HC-VC-76 2.4
HC-DC-90 25.1
HC-DC-91 6.9
HC-DC-92 3.3
HC-VC-74 64.7
HC-NR-100 3.2
0 200 400 Feet
RETEC
WHATCOM WATERWAY FEASIBILITY STUDY
PORTB-18876-240
SHALLOW SUBSURFACE SEDIMENT DATA (0.4-4) (CUMULATIVE ENRICHMENT RATIO)
DATE: 9/19/06
DWN. BY: KBL/ftc
FILE: T:/POB_WHATCOM/PROJECTS/CER_HC.MXD
FIGURE: 2-5